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JRCS

JOHN REICH COLLECTORS SOCIETY
P.O. Box 3039 Centennial, CO 80161

The purpose of the John Reich Collectors Society (JRCS) is to encourage the study of numismatics, particularly United States gold and silver coins minted before the introduction of the Seated Liberty design, and to provide technical and educational information concerning such coins.

Annual dues \$25.00
Life Membership \$625.00

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The John Reich Journal is the official publication of the Society and is distributed to all members in good standing. Members are encouraged to submit any articles encouraging the study of numismatics and / or relating to early United States gold and silver coins to the editors. Especially needed are articles containing new information about die marriages, die states of published die marriages, attribution methods, collections, collectors, etc.

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Cover Photos: The cover coin is an 1833 LM-3.5 half dime from the collection of Stephen A. Crain. Steve obtained this coin from the Jules Reiver sale held at Heritage in 2006. Reiver had owned the coin since 1980, when he purchased it from "Coins 'n Such." The die remarriage is quite rare, a strong R-7, with just four examples reported in the 2019 census. In preparation for the Jules Reiver sale, Crain decided to focus on just two coins, for he knew there would be strong competition and strong bids on nearly all of the half dimes. Crain focused on the two late die state coins he needed for his collection: the 1829 LM-3 with cud and this 1833 LM-3.5. By bidding on just two coins, Crain achieved the desired result and filled two very important and difficult holes in his collection.

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Editor's Comments

The annual American Numismatic Associations World's Fair of Money is fast approaching and with it our annual meeting. The officers would like to invite all of you to attend our annual meeting to be held Wednesday August 14th at 8-9:30AM in room 21 of the Donald E Stephens Convention Center. We will be conducting the business of the organization including elections, awarding of the Jules Reiver Literary Award, an induction into the JRCS Hall of Fame and hosting an educational presentation by Louis Scuderi, "John Reich, The Early Years."

There are numerous meetings and presentations planned for the show that JRCS members may find interesting. Some include the Bust Quarter Collectors Society on Wednesday from 2-3:30 in room 22. The Bust Half Nut Club board meeting, closed to non-members of the BHNC, at 8AM on Thursday. The Liberty Seated Collectors Club at 9AM also on Thursday in room 23. The Numismatic Bibliomania Society (NBS) has a symposium scheduled at 1PM in room 22. The BHNC general meeting, everyone welcomed, at 2PM in room 22. Jim Koenings will be speaking on Reeded Edge halves, 1837 GR-23 and 25. See more on page 28. On Friday the meetings include EAC at 9AM in room 23 and the NBS has their general meeting at 11:30 in room 44.

There are a couple of interesting presentations planned for the show by the ANA that our members may want to schedule. The first is on

Thursday in room 6 and is "Gaining Insight Through Studying Die Varieties" by John Baumgart. I do not know if John is speaking about classic designs or more modern coins but I'm sure collectors can draw some correlation between his talk and our interests. Our own David Finkelstein will be speaking on Friday on "Historical Documents Provide Insight About 1794 US Silver Coin Production", also in room 6.

The authors of the articles presented here in this journal have gone all out in researching the bust coinages for the enjoyment of our membership. All now become eligible for next year's balloting for the Jules Reiver Literary Award. The next issue of the JR Journal is scheduled for Fall. If you have anything for submission the deadline will be October 1. I have already spoken to a couple authors working on exciting material for inclusion.

Our Census Keeper for the dimes, Jim Matthews, has informed me that he will be working on preparing it for the next issue. Please forward your information to Jim as early as possible so he has time to compile the information prior to the deadline. Information is below on submitting your census for inclusion.

So, until we meet again, either in person or in print, I hope you have a wonderful time with your hobby and find something interesting to add to your collection.

I would like to have your census information sent to me in the following format:

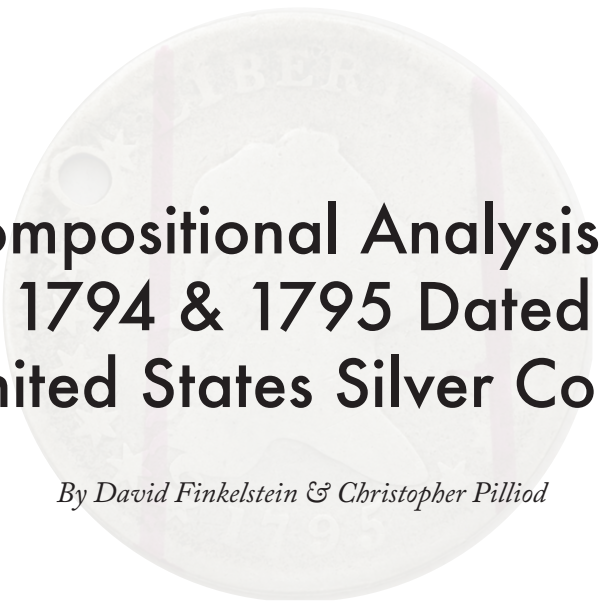
Date, Marriage, Service, Grade IE: 1814 JR-1, P35.

Please use P for PGCS, N for NGC, A for ANACS and R or no letter for Raw coins.

You can email in excel (preferred) or a simple listing to bustdollar@yahoo.com.

Snail mail should be addressed to Jim Matthews PO Box 1118 Mount Jackson, VA 22842.

The census will include all dimes from the 1792 disme through the bust issues of 1837.



Compositional Analysis of 1794 & 1795 Dated United States Silver Coins

By David Finkelstein & Christopher Pilliod

INTRODUCTION

Most numismatists agree that the single most important Mint related legislation in our nation's history was the Mint and Coinage Act of April 2, 1792 [herein referred to as Mint and Coinage Act]. In addition to establishing the first United States Mint, one of the key aspects of this law was Congress's mandate for the composition of our nation's new silver coinage. Per Section 13:¹

"And be it further enacted, That the standard for all silver coins of the United States, shall be one thousand four hundred and eighty-five parts fine to one hundred and seventy-nine parts alloy; and accordingly that one thousand four hundred and eighty-five parts in one thousands six hundred and sixty-four parts of the entire weight of each of the said coins shall consist of pure silver, and the remaining one hundred and seventy-nine parts of alloy; which alloy shall be wholly of copper."

The law specified that silver coins were to contain 1485 parts of pure silver and 179 parts of pure copper alloy. This equated to a standard of 1485 / 1664 or 89.24278% or 89.24+% pure silver, and 10.75722% or 10.76-% pure copper alloy. Archival research reveals that under the leadership of the Mint's first and second Directors, David Rittenhouse and Henry William de Saussure, most of the 1795 dated silver coins, and possibly some of the 1794 dated silver coins were produced to a standard of 90.00% silver and 10.00% copper alloy. Then, effective November 6, 1795, under the leadership of its third Director, Elias Boudinot, the Mint reverted to the 89.24+% silver and 10.76-% copper alloy standard.

On October 27, 1795, one day prior to his final day in office, Henry William de Saussure wrote a letter to President Washington.² Included in de Saussure's letter is the following:

"It is important to inform you... that the standard of the silver coin, in use at the mint, differs from the standard fixed by law..."

Before my operation commenced under this law, it was supposed by the best informed men that this standard was too low; would debase the coin too much; and was inconvenient in other respects... The alteration contemplated went to the establishment of a standard, which required that nine parts in ten should be fine silver, the other tenth alloy [or 90.00% silver and 10.00% copper alloy]..."

On December 3, 1795, Elias Boudinot issued the Director of the Mint's yearly report to Secretary of State Timothy Pickering.² Pickering forwarded the report to President Washington six days later.³ Of special note in Boudinot's report is the following:

"... the Director, on coming into office, found, that for some special reasons, the standard of coins, heretofore completed, varied, in a small degree, from that established by law... Whatever force those reasons may have with the Legislature, the Director did not think himself justifiable in permitting so important a measure to be continued, without legislative sanction; he has, therefore, issued orders, that, in future, the precise terms of the act of Congress, in this respect, should be observed;"

President Washington forwarded both de Saussure's letter and Boudinot's report to Congress on December 14, 1795.⁴ Both documents were also printed in the Wednesday, February 3, 1796 edition of Claypoole's American Daily Advertiser; a Philadelphia based newspaper.

PROJECT OVERVIEW

Documents written by de Saussure and Boudinot stated that the Mint violated the Mint and Coinage Act by producing silver coins to a standard of 90.00% silver and 10.00% copper alloy, however there was no supporting physical evidence provided. Although the Mint and Coinage Act required annual assays of the precious metal coins, the assays of 1794 and 1795 dated silver coins did not occur. Between April 2015 and August 2018, the authors completed the first phase of a multi-phase project to obtain the physical evidence to confirm de Saussure's and Boudinot's statements. The project was designed to determine:

1. the chemical composition of 1794 and 1795 dated silver coins,
2. the chemical composition of 1794 and 1795 dated copper coins,
3. whether Mint personnel attempted to produce any of the 1794 and 1795 dated silver coins to a standard of 89.24+% silver and 10.76-% copper alloy as per the Mint and Coinage Act, and
4. whether Mint personnel attempted to produce any of the 1794 and 1795 dated silver coins to a standard of 90.00% silver and 10.00% copper alloy, thus violating the Mint and Coinage Act.

The approach taken was to first determine the chemical compositions of 1794 and 1795 dated silver coins, and 1794 and 1795 dated copper coins. Then, using statistical analyses, ascertain whether the Mint's targets for the silver coins were 89.24+% silver and 10.76-% copper alloy, and/or 90.00% silver and 10.00% copper alloy.

Two chemical analysis technologies were used to determine the chemical compositions of the coins analyzed; X-Ray Fluorescence (XRF) and Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP-AES).

MAJOR SUMMARY FINDINGS

Physical evidence will be presented in this article to prove that:

1. The Mint initially targeted 1794 dated silver coins to a standard of 89.24+% silver and 10.76-% copper alloy.
2. The Mint targeted most of the 1795 dated silver coins to a standard of 90.00% silver and 10.00% copper alloy, thus violating the Mint and Coinage Act.
3. The Mint refined silver bullion deposits via a pyrotechnic lead process.

XRF ANALYSIS

X-Ray Fluorescence (XRF) is a non-destructive analytical technique used to determine the elemental composition of materials. XRF is based on the principle that individual atoms, when excited by an external energy source, emit X-ray photons of a characteristic energy or wavelength. The intensity of X-rays produced provide a measure of the amount of the element present by comparisons with reference standards. These standards are obtained from XRF manufacturers and certified and approved industry suppliers.

XRF analysis was performed on unprepared surfaces of two 1795 Half Dollars. Although Half Dollars are approximately 2,150 microns thick, the X-rays only penetrate approximately 6 to 10 microns. Three different areas of each coin's surface

were analyzed. Each analysis showed above standard silver content (94% - 97%), with below standard copper content (2% - 4%), and a residual (or relatively large) level of silicon (see Table 1).

What	Area	Silver %	Copper %	Silicon %
1795 O-122	1	97.43	2.09	0.48
	2	97.07	2.42	0.51
	3	96.36	3.11	0.53
1795 O-105	1	95.49	3.87	0.64
	2	94.45	3.92	0.63
	3	95.76	3.61	0.63

Table 1
1795 O-122 / O-105 XRF Surface Analysis

COPPER LEACHING & ENVIRONMENTAL CONTAMINATION

Copper is much more prone to corrosion than silver. During the course of normal circulation and exposure to air, liquids, and other environmental contaminants, copper will leach (dissolve) from the surface of silver coins. This results in an artificially higher percentage of silver and a lower percentage of copper on the surface. In addition, surfaces of coins get contaminated with other elements due to contact with humans and environmental effects. An element that is detected on the surface of a coin may not be found subsurface. Based on only the results in Table 1, it was hypothesized that the presence of silicon was a result of environmental contamination as the coins circulated.

The 1795 O-122 and 1795 O-105 Half Dollars were then sliced into three pieces with a diamond cutter to minimize kerf loss [the loss associated with the cutting

tool]. The center piece of each Half Dollar was ground, removing approximately 10% of the metals from each side and edge, and polished to insure uniform removal. The target of 10% removal by weight was to insure that no surface effect would interfere with the results.

XRF analysis was then performed on three different areas within the subsurface of each of the 1795 Half Dollars. The results identified 90% - 91% silver content, 9% -10% copper content, and no silicon (see Table 2).

Whereas the XRF analysis of the surface of the coins (Table 1) identified 0.48% to 0.64% silicon, no silicon was detected subsurface, and therefore its presence is due to environmental contamination.

Subsurface XRF analysis of the coins identified no trace (or relatively low) amounts of any element. Since the XRF unit at our disposal employed only factory standards for major and minor elements, with no industry accepted curve fitting, this analysis was deemed semi quantitative. For the precision required for this endeavor, XRF was not deemed an adequate method for basing any conclusions. A more precise methodology was required for the level of discrimination for this project.

What	Area	Silver %	Copper %
1795 O-122	1	90.07	9.93
	2	90.38	9.62
	3	90.78	9.22
1795 O-105	1	90.04	9.96
	2	90.45	9.55
	3	91.02	8.98

Table 2

1795 O-122 / O-105 XRF Subsurface Analysis

ICP-AES ANALYSIS

A benchmarking study was conducted by contacting professionals in the analytical field with the specific objective of determining which tool and method would best discriminate and most accurately measure the composition of a silver-based coin. Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP-AES) was selected as the method for analyzing the chemical composition of the subsurface of the coins. ICP-AES is a destructive analysis that provides extreme accuracy of alloying, residual, and trace elements. It is not often employed for alloying elements above the 15% range, therefore ICP-AES was not used in measuring the silver content of the subject coins. ICP-AES analysis was employed to determine copper, all residual elements, and all trace elements. The silver percentage was therefore reported as the "difference".

Each sample is first dissolved in nitric acid; a highly corrosive acid. A plasma torch then vaporizes fine droplets of the sample at a temperature of approximately 12,000 degrees Fahrenheit. The atoms of the sample generate wavelengths that are measured by an array of semiconductor photodetectors. Note that for some elements, ICP-AES is accurate to parts per trillion.

In order to determine the true composition of a silver coin, analysis below the surface of the coin is essential. Since the subsurface would not have been subjected to environmental contamination or copper leaching, the elements and their percentages are the same as the day the bullion deposit was refined and melted at the Mint.

DENOMINATION SELECTION & COIN PREPARATION

A sufficient quantity of affordable silver coins had to be obtained for analysis. Identifying the denomination to be analyzed via ICP-AES was easy:

- 1794 and 1795 Half Dismes were too thin. Once the surfaces of a Half Disme were ground down, there would be nothing left to analyze.
- Dismes and Quarters were first struck in 1796, and were therefore not considered since the scope of this project is 1794 and 1795 silver coins.
- Destroying a 1794 Dollar for ICP-AES chemical analysis was not an option.

The cost of purchasing one damaged 1795 Dollar was equivalent to the cost of purchasing three or four damaged 1795 Half Dollars.

The 1795 Half Dollar was selected as the denomination to analyze. Analyzing at least one 1794 Half Dollar was crucial. Obtaining one could take some time, effort and luck.

Surface preparation prior to ICP-AES analysis was as previously described. Each coin would first be cut into three pieces using a diamond cutter (see Figures 1 and 2). The surfaces and edges of the center piece would be ground away (see Figure 3) and polished (see Figure 4), thus eliminating any areas containing environmental contamination and the effects of copper leaching. The center piece would then be sent for ICP-AES analysis, leaving two pieces in reserve for future testing.

Figure 1
1795 O-116
Marked
For Cutting



Figure 2
1795 O-116
Sliced
Into 3 Pieces



Figure 3
1795 O-116
Center Piece
After Grinding



Figure 4
1795 O-105
Center Piece
After Polishing



ICP-AES RESULTS – 1795 O-122 / O-105 HALF DOLLARS

ICP-AES chemical analysis is expensive. To confirm the authors' surface preparation approach and expectations of ICP-AES chemical analysis, the ground and polished center pieces of the 1795 O-122 and 1795 O-105 Half Dollars that were previously analyzed via XRF were sent to an independent testing laboratory. ICP-AES analysis was performed on two different 0.5 gram samples from each coin (see Table 3).

appropriate amount of pure copper to add to attain the target of the silver coinage composition, whether it was 90.00% silver or 89.24+% silver. The silver and copper was then melted, and poured into one or more ingots.

Although the above steps in the Mint's workflow is referred to as Melting & Refining, it was actually Refining & Melting.

Even if today's advanced chemical, metallurgical, electrical, pyrometrical and computer technologies were used to refine and melt a silver bullion deposit, no two heats would produce the exact same chemical results. Likewise, in 1794 and 1795, no two heats produced the exact same chemistry. In addition, the control of the silver and copper was significantly less accurate in 1794 and 1795 as compared to today.

Several factors affected the final chemistry of a silver-copper alloyed coin:

- Was the silver bullion and copper refined properly?
- Was the amount of copper added to the refined silver calculated correctly?
- Was the refined silver and copper weighed correctly?
- Were there any other elements in the refined silver or the refined copper?
- Were there any contaminants in the melting pots?
- If trace (a relatively low amount) and/or residual (a relatively high amount) elements were identified in the coins analyzed, what were their origins?

What	Sample	Silver %	Copper %	Gold %	Lead %	Other %
1795-122	1	90.00	9.20	0.38	0.35	0.07
	2	90.02	9.18	0.38	0.35	0.07
1795-105	1	90.40	9.16	0.20	0.22	0.02
	2	90.46	9.10	0.20	0.22	0.02

Table 3

1795 O-122 / O-105 ICP-AES Subsurface Analysis

Whereas XRF analysis of the subsurface of the two 1795 Half Dollars identified only silver and copper (Table 2), ICP-AES analysis identified silver, copper, gold, lead, and trace amounts of arsenic, bismuth and zinc. Note that the arsenic, bismuth and zinc percentage totals are in the "Other%" column.

EACH HEAT AT THE MINT PRODUCED DIFFERENT RESULTS

Silver bullion deposits were refined by the Mint in manageable batches or heats. The target for the refined silver was obviously pure or 100% silver. After separation from the other elements contained within the silver bullion deposit, the refined silver was weighed. Then, using pencil and paper, the math was performed to calculate the

MULTIPLE HALF DOLLARS HAD TO BE ANALYZED

Since no one had previously attempted to determine the true chemical composition of an 18th century United States silver coin, certain assumptions were made. These assumptions were based on the quantities of Half Dollars that were transferred (or delivered) from the custody of Chief Coiner Henry Voigt to the custody of Treasurer of the Mint Dr. Nicholas Way during calendar year 1795. Per the Mint's Bullion Journals, Half Dollar deliveries occurred between February 4 and June 5, 1795:⁵

- February 4, 1795: 18,164
- March 3 and 30, 1795: 107,468
- April 11 and 30, 1795: 93,833
- May 6 and 16, 1795: 95,312
- June 5, 1795: 3,067

The authors' assumptions were as follows:

- Whereas the silver bullion for the coins from the early part of the 1795 Half Dollar emission order sequence was most likely refined on or prior to February 4, 1795, the silver bullion for the coins from the later part of the emission order sequence was most likely refined between early May and early June 1795.
- If die marriages from the early, middle and later parts of the 1795 Half Dollar emission order sequence were analyzed, then the silver in the coins analyzed was undoubtedly refined at different times.
- If the analysis of multiple 1795 Half Dollars exhibited statistically similar results, the confidence levels would increase that the *rule* was analyzed, and not the *exception*.

- The greater the number of 1795 Half Dollars analyzed, the greater the confidence level that the statistical analyses were determining whether the Mint melted the metals in the silver coins to a standard of 89.24+% silver and 10.76-% copper alloy, and/or to a standard of 90.00% silver and 10.00% copper alloy.
- Analyzing at least one 1794 Half Dollar was crucial to the project. Who would donate one to be sliced into three pieces, then have the surfaces of the center piece ground down? Obtaining a coin could possibly take some time.

1794 & 1795 COPPER COINS HAD TO BE ANALYZED

Between September 1792 and January 1793, the Mint placed over 100 advertisements in local Philadelphia newspapers to buy "old copper". Based on the number of copper coins delivered to the Treasurer of the Mint during 1793, 1794 and 1795, and the number of silver coins delivered during 1794 and 1795, the Mint needed a minimum of 46,000 pounds of copper to support copper and silver coin production during 1793, 1794 and 1795.⁵

Analysis of contemporary documents from the Library of Congress and entries in Mint ledgers stored at the National Archives and Records Administration (NARA) has determined that the Mint purchased approximately 2,500 pounds of copper from the general public during 1792 and 1793. Since these copper purchases were not enough to support 1793 copper coin production, the Mint sought additional sources for their copper needs. Approximately 44,500 pounds of copper were purchased from merchants and suppliers in Pennsylvania and New York,

and 33,000 pounds of copper sheets were imported from England.⁶ Approximately 81,000 pounds of copper were purchased during 1792, 1793, 1794 and 1795; which included an additional 1,000 pounds of copper purchased from the general public during 1794 and 1795. This was more than enough to support copper and silver coin production during 1793, 1794 and 1795.

The only way to insure that the copper in the copper coins and the copper alloy in the silver coins was pure (or nearly so), was to refine it. How do we know the Mint refined the copper? On October 28, 1794, Director of the Mint David Rittenhouse sent a letter of Secretary of State Edmund Randolph. Of note, the letter included the following:

"A large quantity of copper still remains on hand, part of it not yet refined. This will be wrought occasionally so as not to interfere with the silver coinage".

The authors assumed that the copper used to produce copper coins and the copper used to alloy the silver coins originated from copper that the Mint purchased from the general public and suppliers in the United States and England. Chemical analysis of 1794 and 1795 copper coins was required to determine what elements other than copper and their respective levels contributed to the composition of silver coins.

EPN-NES, HERITAGE & THE TERRY BRAND ESTATE

This project was going to be expensive. Financial support was required. Thanks to support from the Eric P. Newman Numismatic Education Society, funds were obtained for purchasing coins and paying for the ICP-AES chemical analyses. Thanks to the efforts of Jim Halperin and

Jim Stoutjesdyk of Heritage Auctions, the Terry Brand Estate donated a 1794 Half Dollar for ICP-AES analysis. Although the coin was severely corroded and barely discernable, enough details were present to positively attribute the coin as a 1794 O-105.

PROJECT GOALS

After the XRF results of the surface and the XRF and ICP-AES results of the subsurface of the 1795 O-122 and O-105 Half Dollars were analyzed, there were more questions than answers. There was, however, enough information to set the project's goals. The project was designed to answer the following questions:

1. What was the chemical composition of (a) 1794 / 1795 dated Half Dollars, as well as (b) some post 1795 dated silver coins?
2. Did the Mint attempt to produce any of the 1794 / 1795 silver coins to a standard of 89.24+% silver and 10.76-% copper alloy as required by the Mint and Coinage Act?
3. Did the Mint attempt to produce any of the 1794 / 1795 silver coins to a standard of 90.00% silver and 10.00% copper alloy, thus violating the Mint & Coinage Act?
4. Were the copper coins of 1794 / 1795 pure copper?
5. Is it even conceivable that the knowledge base and technology of 18th century chemistry and metallurgy allowed Mint personnel to differentiate between 90.00% silver and 10.00% copper .vs. 89.24+% silver and 10.76-% copper?

6. Are there trace and/or residual elements in the silver coins that will identify the silver refining method employed by the Mint?
7. Are there trace and/or residual elements in the copper coins that will identify the copper refining method employed by the Mint? [not addressed in this article]

THE IMPORTANCE OF THE 1794 O-105 HALF DOLLAR

The 1794 O-105 Half Dollars were struck immediately after the 1794 O-109 and 1794 O-111 die marriages.⁹ There are three known 1794 O-109 Half Dollars and the 1794 O-111 is presently unique. The 1794 O-105 Half Dollar was therefore most likely the first mass produced 1794 Half Dollar die marriage.

Since 5,300 1794 Half Dollars were transferred from the custody of Chief Coiner Henry Voigt to Treasurer of the Mint Dr. Nicholas Way on December 1, 1794,⁵ it is also logical to assume that the 1794 O-105 Half Dollars were most likely struck around this time. Chemical analysis of the 1794 Half Dollar was critical for determining whether Mint personnel attempted to refine the silver in this coin to an 89.24+% or 90.00% standard.

SEVEN 1795 HALF DOLLARS WERE OBTAINED FOR ICP-AES

Seven holed and/or damaged 1795 Half Dollars were obtained for ICP-AES (see Figure 5). Note that the die marriages in Figure 5 are listed in emission order sequence.⁹ Arrows identify the die marriages of the coins analyzed.

Since die marriages from the early, middle, and late parts of the 1795 Half

Dollar emission order sequence were to be analyzed, the results would most likely identify whether the Mint:

1. initially melted the metals in the 1795 Half Dollars to a standard of 90.00% silver and 10.00% copper alloy, or
2. initially melted the metals in the 1795 Half Dollars to a standard of 89.24+% silver and 10.76-% copper alloy, then changed the standard to 90.00% silver and 10.00% copper alloy.

1795 Half Dollar Emission Order Sequence (Tompkins)

1. 1795 O-119	17. 1795 O-108
2. 1795 O-121	18. 1795 O-128
3. 1795 O-117 ←	19. 1795 O-111
4. 1795 O-120	20. 1795 O-112
5. 1795 O-122 ←	21. 1795 O-110 ←
6. 1795 O-123	22. 1795 O-126
7. 1795 O-129	23. 1795 O-127
8. 1795 O-130	24. 1795 O-104
9. 1795 O-131	25. 1795 O-105 ←
10. 1795 O-115 ←	26. 1795 O-102
11. 1795 O-116 ←	27. 1795 O-132
12. 1795 O-124	28. 1795 O-101
13. 1795 O-125	29. 1795 O-103
14. 1795 O-113	30. 1795 O-106
15. 1795 O-114	31. 1795 O-107
16. 1795 O-109 ←	

Figure 5

The 7 - 1795 Half Dollars Analyzed Via ICP-AES

ICP-AES RESULTS – 1794 & 1795 COPPER COINS

The ground and polished center pieces of one 1794 Cent and one 1795 Half Cent were sent to an independent laboratory. ICP-AES analysis was performed on two different samples from each coin. The results identified 98% - 99% copper, with residual levels of lead and arsenic, and trace amounts of bismuth and silver in each coin (see Table 4).

Arsenic, bismuth, lead and silver are generally found in copper ore. The processes available in the 18th century to remove the arsenic, bismuth and lead included liquation, roasting and smelting of the copper. Silver was separated and recovered from the copper via the parting process. All of these processes took time and cost money.

Note that it is not known if every copper acquisition was refined by the Mint, or if any other processes were performed to part or remove other elements. It is possible that the lead in the copper may be a combination of a natural trace level plus a residual amount from a refining process.

Whether or not parting and/or removal processes occurred, both copper coins contain residual levels of lead and arsenic, and trace amounts of bismuth and silver. Until additional 1794 and 1795 copper coins are analyzed via ICP-AES, it is assumed that all 1794 and 1795 copper coins contain residual levels of lead and arsenic, and trace amounts of bismuth and silver.

ICP-AES RESULTS — SILVER COINS

ICP-AES chemical analysis was performed on four different samples from the 1794 Half Dollar, and two different samples from each 1795 Half Dollar (see Table 5). The 1795 Half Dollars in Table 5 are arranged by emission order sequence.⁹

ICP-AES chemical analysis was also performed on one 1806 Quarter, one 1807 Quarter, one 1807 Half Dollar, and one 1855-O Half Dollar (see Table 6). Two different samples from each coin were analyzed.

RESIDUAL GOLD IN THE SILVER

Not only are residual levels of gold observed in the 1794 and 1795 Half Dollars, residual levels of gold are observed in all of the silver coins dated 1806 through 1855 (see Tables 5 and 6). One hypothesis for this was that the furnaces, pots, and crucibles that the Mint used to refine the silver bullion deposits were the same used to refine the gold bullion deposits. As a result, the silver bullion refining was contaminated with gold.

What	Sample	Copper %	Lead %	Silver %	Gold %	Arsenic %	Bismuth %
1794 Cent	1	98.20	1.62	0.01	0.00	0.08	< 0.01
	2	98.20	1.62	0.01	0.00	0.08	< 0.01
1795 ½ Cent	1	99.00	0.36	0.08	0.00	0.37	0.15
	2	98.99	0.36	0.08	0.00	0.37	0.15

Table 4
1794 / 1795 Copper Coin ICP-AES Subsurface Analysis

The rebuttal to this theory is the fact that gold is observed in the 1794 O-105 Half Dollar. The Mint's first gold bullion deposit occurred on February 12, 1795, and was made by Moses Brown.⁷ There was no gold in the Mint during calendar year 1794, therefore the residual levels of gold in the 1794 O-105 Half Dollar could not have originated from cross contamination.

Note that the residual levels of the gold in the 1795 Half Dollars are 33% to 317% higher than the residual levels of the gold in the 1794 Half Dollar. Was this due to cross contamination? Again, no. The last group

of Half Dollars that were transferred from the custody of Chief Coiner Henry Voigt to Treasurer of the Mint Dr. Nicholas Way during calendar year 1795 occurred on June 5, 1795.⁵ Although five small gold bullion deposits were made with the Mint between February 12 and June 18, 1795, the first gold bullion deposit that was transferred to the custody of Henry Voigt for refining, melting and processing occurred on July 21, 1795.^{5,7} Since all 1795 Half Dollars were struck prior to the first gold bullion deposit being processed, the residual levels of gold in the 1795 Half Dollars could not have originated from cross contamination.

What	Sample	Silver %	Copper %	Gold %	Lead %	Other %
1794 O-105	1	88.67	11.01	0.12	0.17	0.03
	2	88.75	10.81	0.12	0.17	0.03
	3	88.43	11.14	0.12	0.17	0.02
	4	88.73	10.95	0.12	0.18	0.02
1795 O-117	1	88.96	10.23	0.36	0.43	0.02
	2	88.48	10.71	0.34	0.45	0.02
1795 O-122	1	90.00	9.20	0.38	0.35	0.07
	2	90.02	9.18	0.38	0.35	0.07
1795 O-115	1	89.24	10.34	0.20	0.19	0.03
	2	89.29	10.30	0.20	0.18	0.03
1795 O-116	1	89.83	9.87	0.20	0.09	0.01
	2	89.87	9.82	0.20	0.10	0.01
1795 O-109	1	89.79	9.83	0.21	0.14	0.03
	2	90.20	9.45	0.20	0.12	0.03
1795 O-110	1	90.97	8.70	0.16	0.14	0.03
	2	91.31	8.35	0.16	0.14	0.04
1795 O-105	1	90.40	9.16	0.20	0.22	0.02
	2	90.46	9.10	0.20	0.22	0.02

Table 5

1794 & 1795 ICP-AES Silver Coin Subsurface Analysis

What	Sample	Silver %	Copper %	Gold %	Lead %	Other %
1806 Quarter	1	88.27	10.75	0.85	0.10	0.03
	2	88.35	10.69	0.82	0.10	0.04
1807 Quarter	1	88.40	10.68	0.84	0.05	0.03
	2	87.86	11.17	0.85	0.11	0.01
1807 Half Dollar	1	87.87	11.24	0.80	0.08	0.01
	2	87.78	11.24	0.83	0.11	0.04
1855-O Half Dollar	1	88.64	10.63	0.47	0.21	0.05
	2	88.95	10.22	0.48	0.28	0.07

Table 6

1806 – 1855 ICP-AES Silver Coin Subsurface Analysis

We now know that silver bullion deposits contained residual amounts of gold. We also know that when the Mint refined silver bullion deposits during 1794 and 1795, they did not perform the parting process to separate the gold from the silver. How do we know this?

On July 14, 1795, James Swan made the 19th through 22nd silver bullion deposits with the Mint; valued at \$62,325.51. Assay results identified a significant amount of gold within his deposits. On August 14, 1795, Swan's deposits were *"withdrawn from the Mint for the purpose of separating a certain proportion of Gold which the Bullion was discovered to contain"*. James Swan's silver bullion deposits were the only deposits that were withdrawn from the Mint during 1794 and 1795 for the gold parting process.^{5,8}

RESIDUAL LEAD IN THE SILVER

Residual levels of lead are observed in the 1794 Half Dollar and the seven 1795 Half Dollars (see Table 5). During and 18th century, lead was commonly used to refine

silver. Paul-Jacques Malouin (1701-1778) was a French physician and chemist. He was the leading contributor on chemistry in multiple publications and encyclopedias published during his time. In 1751 he authored *Affinage des métaux* ('The Refinement of Metals'). Page 160 of that publication provides an overview of how to refine silver via the *"lead method"*.

The process, known as the *Lead Refining Process*, is summarized as follows:

- The silver bullion is melted. [Silver melts at 1,763 degrees Fahrenheit.]
- A large amount of lead is melted with the bullion. [Lead melts at 621.4 degrees Fahrenheit.] Lead, being more dense than silver, melts and sinks to the bottom. Lead attracts precious metals. As the lead sinks, the silver and gold adhere to it.
- The top layer (or the *slag* layer) of the solution contains the non-precious metals and other trace elements. This slag layer is removed. Note that when the Mint refined foreign silver coins, this slag layer included the copper alloy.

- The remaining solution is a mixture of lead and silver, with residual levels of gold. Air is then blown over the molten mixture. Oxygen (O) combines with the lead (Pb) to form lead oxide or litharge (PbO).
- The temperature of the furnace is raised, and the litharge is absorbed by capillary action into the furnace's hearth linings. This leaves silver with residual amounts of gold from the silver bullion and lead from the refining process.

To date, no contemporary documents have been found to confirm that the Mint used the Lead Refining Process during 1794 and 1795. The conclusion that this process was used is based on the residual levels of lead in the silver plus analysis of Mint ledgers stored at the NARA. Per *Affinage des métaux*, at least two parts lead to one part silver was required. Based on analysis of silver bullion deposits made with the Mint during 1794 and 1795⁸ [not provided in this article], approximately 4 metric tons of lead was required to refine these silver bullion deposits. Mint ledgers indicate that approximately 6 metric tons of lead was purchased prior to January 1, 1796.⁶

There would be no metallurgical use or utility for the Mint to purchase lead unless the Lead Refining Process was being used to refine silver [and most likely gold] bullion deposits.

SOME LEAD MAY HAVE BEEN PRESENT IN THE COPPER ALLOY

Not only are there residual levels of lead in the silver coins, there are residual levels of lead in the 1794 copper Large Cent and 1795 copper Half Cent. It is therefore important to determine the true source of

the lead found in the silver coins. Is the source of the lead:

- a residual from the silver bullion deposit being refined via the Lead Refining Process,
- a trace or residual level in the copper alloy, or
- a combination both?

Until additional 1794 and 1795 copper coins are analyzed, it is assumed that all copper coins dated 1794 and 1795 contain residual levels of lead, and the copper used to alloy the silver also contain residual levels of lead.

For the purpose of this analysis, the assumption has been made that five eighths or 62 ½ % of the lead in the silver coins was a residual of the Lead Refining Process, and three eighths or 37 ½ % of the lead in the silver coins originated from the copper alloy.

PRELIMINARY CONCLUSIONS REGARDING GOLD AND COPPER

What the Mint weighed as the refined silver was actually the amount of the silver plus the entire amount of the gold plus 0.625 times the amount of the lead.

What the Mint used as copper alloy was actually the amount of the copper plus the entire amount of the other trace elements, plus 0.375 times the amount of the lead.

Refer to Table 7 for the adjusted percentages of the silver and copper, based on the preliminary conclusions in this section.

1794: STATISTICAL ANALYSIS & PRELIMINARY CONCLUSION

Multiple T-test statistical analyses were performed on the data for the 1794 O-105 Half Dollar in Table 7. Based on only the ICP-AES results for the 1794 O-105 Half Dollar:

- For the heat (batch) of silver that struck the 1794 O-105 Half Dollar, there is a 2.8% probability that it was melted to a standard of 89.24+% silver and 10.76-% copper alloy.
- Statistically, there is only a 0.1% probability that the metals in the 1794 O-105 Half Dollar were melted to a standard of 90.00% silver and 10.00% copper alloy.

Preliminary Conclusion: The authors are 28 times more confident that the 1794 O-105 Half Dollar was melted to a standard of 89.24+% silver / 10.76-% copper alloy as required by the Mint and Coinage Act.

If additional 1794 Half Dollars are obtained for ICP-AES analysis, statistical analyses will be performed, and the confidence levels will be updated.

1795: STATISTICAL ANALYSIS & PRELIMINARY CONCLUSION

Between February 4, 1795 and June 5, 1795, 317,844 Half Dollars were transferred from the custody of Chief Coiner Henry Voigt to Treasurer of the Mint Dr. Nicholas Way. No Half Dollars were delivered between June 6, 1795 and December 31, 1795,⁵ therefore it is assumed that no 1795 dated Half Dollars were struck after June 5, 1795. Since the seven 1795 Half Dollars in Table 5 are die marriages from the early, middle, and later parts of the 1795 emission order sequence,⁹ it can be stated with confidence

that the silver for these Half Dollars was refined by the Mint over a period of several months (most likely between January, 1795 and early June, 1795).

What	Sample	Silver % + Gold % + 0.625 * Lead %	Copper % + 0.375 * Lead % + Other Trace %
1794 O-105	1	88.90	11.10
	2	88.98	10.90
	3	88.66	11.22
	4	88.96	11.04
1795 O-117	1	89.59	10.41
	2	89.10	10.90
1795 O-122	1	90.60	9.40
	2	90.62	9.38
1795 O-115	1	89.56	10.44
	2	89.60	10.40
1795 O-116	1	90.09	9.91
	2	90.13	9.87
1795 O-109	1	90.09	9.91
	2	90.48	9.53
1795 O-110	1	91.22	8.78
	2	91.56	8.44
1795 O-105	1	90.74	9.26
	2	90.80	9.20

Table 7
Adjusted ICP-AES Silver Coin Subsurface Analysis

Multiple T-test statistical analyses were performed on the data for the seven 1795 Half Dollars in Table 7. Based on only the ICP-AES results for the seven 1795 Half Dollars:

1. There is a 0.00% probability that the composition of the seven 1795 Half Dollars were melted to a standard of 89.24+% silver and 10.76-% copper alloy.
2. There is a 13% probability that the composition of the seven 1795 Half Dollars were melted to a standard of 90.00% silver and 10.00% copper alloy.

Preliminary Conclusion: Based on this initial data analysis, the Mint attempted to melt most, and possibly all of the 1795 silver coins to a standard of 90.00% silver and 10.00% copper alloy. This was a violation of the Mint and Coinage Act.

1794 & 1795: PRELIMINARY CONCLUSIONS

Based on the statistical analysis results for the 1794 Half Dollar and the seven 1795 Half Dollars, plus historical facts, the following preliminary conclusions have been made:

1. To comply with the Mint and Coinage Act, the Mint initially attempted to melt the 1794 Half Dollars to a standard of 89.24+% silver and 10.76-% copper alloy.
2. The Dollars were the first silver coins struck by the Mint in 1794. Delivery Warrant 1 was issued on October 15, 1794 by Mint Director David Rittenhouse to transfer 1,758 Dollars from the custody of Chief Coiner Henry Voigt to the custody of Treasurer of the Mint Dr. Nicholas Way. Delivery Warrant 2 was issued on December 1, 1794 to transfer 5,300 Half Dollars from the custody of Henry Voigt to the custody of Dr. Nicholas Way.⁵
3. Since the 1794 Dollars were struck before the 1794 Half Dollars, it is logical to conclude that the Mint also attempted to melt the 1794 Dollars to a standard of 89.24+% silver and 10.76-% copper alloy.
4. No Half Disme deliveries occurred in 1794. The first Half Disme delivery occurred on March 30, 1795.⁵ Since 1794 Half Dismes exist, they were most likely struck in 1795 from silver melted in 1795.
5. Based on the three prior preliminary conclusions, it is logical to conclude that the Mint *initially* attempted to melt all silver coins struck in 1794 (Half Dollars and Dollars) to a standard of 89.24+% silver and 10.76-% copper alloy.
6. Although the Mint targeted the 1794 Dollars and some or all of the remaining 1794 silver coinage to an 89.24+% silver and 10.76-% copper alloy standard, the capabilities of the Mint personnel and/or limitations of 18th century chemical and metallurgical technology prevented the Mint from achieving their targets.
7. At this time it is unclear when the Mint began melting the silver coins to a standard of 90.00% silver and 10.00% copper alloy, however they did melt 1795 silver coins to a 90.00% silver and 10.00% copper alloy standard, thus violating the Mint and Coinage Act.

NEXT STEPS

1. The combined average amount of gold, lead and arsenic in the Half Dollar samples that were analyzed via ICP-AES (see Table 5) was measured at 0.46%. The difference between a 90.00% silver standard and an 89.24+% silver standard is 0.76%. Since the combined average of the of gold, lead and arsenic is 64% of the difference between the two silver standards, the amounts and true origin of these residuals is critical to statistical analysis. As such, additional 1794 and 1795 copper coins will be subjected to analysis.
2. As mentioned in this article, the silver content was determined via “mass balance”. In other words, all other elements were analyzed with a high degree of precision and the silver was reported as the difference. Over the past several months a silver titration method has been developed at Carpenter Technology [Chris Pilliod's employer]. During the Phase 2 project, all coins analyzed during Phase 1 will be subjected to titration analysis. This method will only measure silver, but with extreme accuracy. The results will be used to confirm or revise the findings of the Phase 1 ICP-AES analysis.
3. Additional 1795 dated silver coins have been obtained for the Phase 2 project. These coins will be analyzed via ICP-AES and silver titration.
4. Once the previous three items are completed, additional statistical analyses will be performed based on the combined Phase 1 and Phase 2 data, confidence levels will be updated, and additional articles will be published.

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Cuds on Capped Bust Silver Coinage

Heads and Tails Are Not Just Opposite Sides of the Coin

By Jeffrey Friedman

Physical properties and basic physics determine much about the coining process. One basic and well known relationship is pressure equals force divided by area. The first coining presses used by the United States mint were screw presses. They were used until steam presses were introduced in 1836. Additionally, it is not clear exactly which coins struck between 1836 and 1838 were minted using the screw press versus the steam press. Most believe all capped bust half dollars with lettered edges were struck using the screw press while reeded edge half dollars were struck using the steam press. Half dimes, dimes, and quarters were struck during this transition period and there does not seem to be definite information regarding

whether screw or steam presses were used for striking some or all of capped bust die marriages during this transition period. During the writing of this article, it will be assumed that the screw press was used for striking all silver capped bust coinage. Below is a table showing the nominal diameters and calculated surface areas of all silver capped bust coinage made through 1838. There were no capped bust silver dollars made. Additionally, if one assumes the force applied via the screw press was the same for all denominations, then simply the relative pressure applied on and by the dies is related to their surface area, which is very similar to that of the planchet. The table below summarizes these calculations.

Capped Bust Denomination	Nominal Diameter (millimeters)	Nominal Area (square millimeters)	Percent of the Area of a Capped Bust Half Dollar	Relative Pressure Compared to a Capped Bust Half Dollar
Half dime	15.5	189	22.8	4.4
Dime 1*	18.8	278	33.5	3.0
Dime 2*	18.5	269	32.4	3.1
Quarter 1*	27.0	573	69.0	1.4
Quarter 2*	24.3	464	55.9	1.8
Half Dollar	32.5	830	100.0	1.0

Table 1

Data on Capped Bust Denomination Planchet Diameters, Areas, and Relative Pressures

**Two slightly different planchet sizes were used when striking capped bust dimes and quarters.*

These data demonstrate that the pressure applied when striking the smaller denomination coins was substantially greater and thus the stress incurred by the dies was clearly much greater than on larger denomination capped bust silver coins. What are the consequences of these pressure and resultant stress differences? One can posit that die injury resulting from stress and wear would have been progressively greater as the denomination and consequent surface area became smaller. How would such die injury manifest itself? The worst injury would be die damage so severe that a piece actually broke away from the die. A slightly less severe injury would be when a piece became loose but did not detach from the die. Even less severe injury could result in die cracks and/or chips adjacent to or within lettering and/or stars or the development of internal cuds (no rim involvement). A recent Journal article by Scuderi discussed stress and die injuries (die chips and cuds) on the reverses of capped bust half dimes¹. Discontinuities, such as where lettering was incuse (vertically with a 90 degree angle to the die surface) on the reverse die and was designed to produce raised

lettering on a coin, was discussed as being the site of greatest stress on the reverse die by Scuderi¹; and thus, where die injury was most likely to occur. The area between lettering and the rim of a coin is in fact where cuds are most likely to occur on all capped bust coinage. Extrapolating to obverse dies, the areas with the greatest discontinuities are where the stars are struck, and this is the area where die cracks often occur and obverse cuds, which infrequently occur, can be found.

Another factor potentially affecting die injury is how some of the applied force interacted with the third side of the coin, namely the edge. Since capped bust half dimes, dimes and quarters were all struck using a closed collar die, injury might be manifest somewhat differently than for capped bust half dollars, which were struck with an open collar. Federal Half Dimes 1792-1837 by Russell Logan and John McCloskey² stated on page 57 that the clearance between the "...closed collar edge die and the anvil die was very small (0.003-0.005") as was the clearance between the edge die and the planchet." Thus, there was very little space for a

broken off piece of the anvil (reverse) die to go other than to be slightly recessed and pushed up against the closed collar edge die. This should make the development of retained cuds much more likely than full cuds on the reverse of capped bust coinage made with a closed collar. Additionally, a piece of a significantly cracked reverse die also could still remain attached to the die prior to actually fully breaking off.

Regarding obverse dies (hammer dies), while physical factors such as stress resulting in the development of cuds are similar to those on reverses (anvil dies), however, there is no closed collar to “retain” or capture any broken piece(s) of the die. Therefore, a retained cud on an obverse required a piece of the obverse die to be loose, but to remain attached to the die itself; this is different than what occurs for some reverse “retained” cuds for coins struck with a closed collar. When a piece of the obverse die becomes totally separated from the die, it will fall off and a full cud will be present. It does not seem likely that loosely attached pieces of a

hammer die are likely to remain in place very long without becoming detached. For reverse dies when struck in a closed collar, if a piece of a die breaks off it can, and often does, remain in place being retained between the main portion of the anvil die and the collar die, and thus can result in a retained cud. The broken piece must be removed from the coining chamber and/or reverse die to result in a coin with a full reverse cud, certainly a more active process than what would occur for an obverse die, where the broken piece would just fall off to produce a full cud.

In order not to create additional complexity during the presentation and discussion of the data in this article, definitions for internal, retained and full cuds will not be specified. Note that internal cuds are considered as retained cuds. Data was tabulated using the classifications (full, internal and retained cud (Figure 1)) that were used in each reference text 2-6 that provided information on the different denominations of silver capped bust coinage.

Figure 1
Examples of Full, Retained and Internal Cuds on Capped Bust Half Dimes



Full Cud



Retained Cud



Internal Cud

The authors of these references deserve much credit for their studies in assembling information on cuds found in each of these series of coins. Very few newly identified cuds have been described after the publication of these references and they are not included in the following table; since they are few, this additional information does not affect the conclusions and observations made in this article. Data on the frequency of observed retained and full cuds reported for capped bust coinage die marriages in the below referenced standard texts are found in Table 2 below.

Many die marriages that developed full cuds can also be found with coins having only a retained cud. However, in the table below, a coin that develops a full cud and is also known with a retained cud will appear only as an entry in the full cud category; therefore, the total number of die marriages with retained cuds is actually higher than cited in the table below.

This data demonstrates that cuds on capped bust silver coinage are clearly much more common on reverses than on obverses for all capped bust denominations that have reported cuds (i.e., were struck in a closed collar). Retained cuds are also much more common on reverses than full cuds, but this is not as clear cut for obverse cuds. Full cuds are still relatively uncommon. Capped bust half dollars with open collars appeared to behave differently. The pressure applied to the dies could have been perhaps dissipated to some degree via the open collar or the relative pressure and resultant stress was just too low to result in the most severe die injury (cuds) seen when striking smaller coinage. Uncontrolled, or limited control, to the expansion of the coin during striking created less stress to the dies as energy dissipated into the coins during striking. Additionally, since half dollars are much larger than dimes and half dimes, the distances between the dentils/rims and

Table 2
Die Marriages with Cuds on Capped Bust Silver Coinage

Denomination	Obverse Cuds		Reverse Cuds	
	Full	Retained	Full	Retained
Half Dime	1*	3*	1	20
Dime	5*	1*	4	20
Quarter	0	0	3	6
Half Dollar	0	0	0	0

** Rim crumbling was not counted as a cud*

the lettering/stars on these coins was also larger. The greater distances may also have impacted the development of cuds. Die cracks usually formed from the dentils and rim to and between the stars on the obverse and from the rim and dentils to the letters and along the lettering on the reverses of these large silver coins, similar to what happened on the smaller denomination capped bust silver coinage. For the smaller denomination coins, cuds clearly developed with an inverse relationship to the size of the coins. Consistent with this observation, no cud has been definitively identified in the capped bust half dollar series, despite the coining of tens of millions.

Cuds remain an interesting area of study and much is yet to be described in the literature. Future study needs to continue.

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* used as it provides a much more comprehensive listing of dime cuds than Davis et al Early United States Dimes 1796-1837.

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*1829 LM-3 Terminal die state with full reverse cud
photo courtesy of W David Perkins, Steve Crain,
"Mr. Half Dime", collection*



*1833 JR-1 NGC MS61 Retained Cud Reverse
Photo courtesy of Heritage Auctions*



1838 GR-5 Another Great Rarity Especially the “Early Sunrise” Die Stage

By Jim Koenings

Most collectors are aware of the fact that the 1838-O Reeded Edge Half is a Classic Rarity. The Mint reports 20 coins produced, however only 9 are known today. They sell in the \$300,000 to \$750,000 range, for what most collectors believe is a proof only issue. Collectors may also be aware that the 1839 GR-1 Reeded Edge Half, also known as the “Small Letter Reverse” is another Classic Rarity that was discovered in 1972 and only 11 specimens are known today. This reverse is the first and only use that is found on Reeded Edge Half Dollars. Some collectors believe it is a Pattern Coin as the mint then used this type reverse on Liberty Seated Halves.

NOW COMES THE 1838 GR-5 DIE MARRIAGE.

In July, 1929, Martin Luther Beistle published a book entitled “A Register of Half Dollar Die Varieties and Sub-Varieties”. In it, he described half dollars that had previously been in his collection. He published 135 deluxe leather covered copies along with 865 green cloth covered regular copies. In 1964, 200 copies of a reprint were made with a black cover. That made 1,200 copies produced.

He had 7 pages of Plate coins, each page showing 20 coins and ranging from 1794 to 1929, including commemorative half dollars. 1838-O is the only Reeded Edge Half shown as a plate coin.

There were 44 descriptions of Reeded Edge Half Dollars including the following description as shown on page 137:

“1838 2a Ac. Same as No. 2, except that there were two dents on the end of the chin. A flat faced star is opposite to the forehead, and all others are cutmfairly sharp.

Rev. Ac. Same as letter A, except for a circular die crack running from the edge, near the middle arrow head, through the lower half of the shield, to the lower edge of the feathers, that are below the left wing, near the body. The ALF in HALF is cut weak and hardly appears above the surface.”

This was the first time, to my knowledge, that a description of an 1838 GR-5 had been written. Below are photos that appear to match that description:

*1838 GR-5 obverse**1838 GR-5 reverse*

The above coin appears to almost perfectly match Bestile's description. The other descriptions were in the same manner and included phrases such as "same as" or "similar to" that it was almost impossible to use these descriptions to form a collection of Reeded Edge Half Dollars, remember there were no photographs of Reeded Edge Half Dollars, other than the one of an 1838-O.

In 1967, Albert Charles Overton published the first book on Early Half Dollar Die Varieties that showed photos of every half dollar from 1794 to 1836. However, he didn't include Reeded Edge Half Dollars from 1836 to 1839, making him the first person to neglect Reeded Edge Half Dollars.

Next came Jules Reiver, his "Variety Identification Manual for United States Reeded Edge Half Dollars 1836-1839" (VIM) was printed in 1988. He printed approximately 100-150 copies. Jules was a wonderful person and perhaps the greatest die marriage collector ever. However,

when referring to Beistle's book said "All of these descriptions may be valid, but I confess that I have not considered them." Jules' manual had 17 die marriages for the year 1838 and did not include an 1838 JR-18 (later called a GR-5).

On May 1, 1988, Sheridan Downey discovered (1838 JR-18) the Number 1 addition to Jules' VIM when he reported that he had purchased from Stack's Auction April 27-30, 1988, Lot 3201 for \$110 + 10%, with the following description:

"Obverse - (1) Field noticeably raised rim to stars 6-7 and above cap. (2) Outer point of star 6 especially weak. (3) Tiny lumps below ear. (4) Dot within intersection of curls above ear which flow down to left of ear. (5) Star 8 weak. (6) Inner point of star 10 which points up is blunt. (7) Inner point of star 11 which points at lower curl has thin crevasse along lower side. (8) Lump within two inner points of star 13, aimed at top of date and dentils below date. (this example has planchet roller marks running vertically, covering entire planchet.)

Reverse - (1) Heavy crack from right rim - point of arrow 2 - upper arrow shaft - lower part of shield - top of tail feathers - left wing. (2) Pronounced weakness at bottom of shield, left talons, stem, arrow feathers and ALF, especially LF. (3) Small tyne atop lowest cross bar, above line 1 of stripe 1. (4) Roughness in recess of shield between stripes 1 and 2, at top. (5) Line on shield between stripes 2 and 3, up to the right, near top."

Apparently, after Sheridan had reported the above coin to Jules, he later purchased it as it became Lot 23435 in Heritage's Auction of "The Jules Reiver Collection Volume III" when it sold January 24-28, 2006.

Dick Graham must have eventually purchased the coin as it appears as one of the 3 known 1838 GR-5's when Dick's book, "A Registry of Die Varieties of Reeded Edge Half Dollars 1836-1839" came out in July, 2012. Dick printed 325 copies of his book. It was sold out by the year 2015. Later, an additional 100 copies were printed in January, 2018. Dick also mentions in his book the difficulty in using Beistle's 1929 publication.

To my knowledge, only one other publication made reference to Reeded Edge Half Dollars and that was Richard Piper's 1976 "The Elusive 1836 Reeded Half Dollar" which only covered the year 1836.

I know of only 2 or 3 persons, other than Dick Graham and myself, that went on to have a very complete collection of Reeded Edge Halves using Jules' VIN. To be honest, I still use Jules' VIM on occasion, to look up certain 1837 die marriages and then convert to Graham numbers.

Since Dick's book has been published, I have seen the following 4 different die stages of 1838 GR-5:

1. At least 2 specimens are known without a crack but having the very weak ALF (0% Die Break) as shown below:



NGC AU details (0% Die Break)

2. At least 2 specimens with a die break that starts at the right rim and goes through arrow 2 and stops at the left edge of the shield (50% Die Break)



Raw AU (50% Die Break)

3. At least 3 specimens with a die break that starts at the right rim and continues to the underside of the middle of the left wing. (75% die break)



PCGS AU details Questionable Color (75% Die Break)

4. At this time, 3 specimens are known with a die break that starts at the right rim by the arrows and continues in an arc to the left rim over the U in UNITED. (100 % Die Break). I shall call this stage the "Early Sunrise" Die Stage. CL owns a PCGS AU55 specimen, I own the NGC AU53 specimen and JAB owns the 3rd (grade unknown).



1838 GR-5 NGC AU53 rev (100% Die Break)

"EARLY SUNRISE" DIE STAGE

I suspect a reverse with a die break that starts at the right rim and continues to the right edge of the shield may exist (25% Die Break). Another possibility might exist with the break through the shield only. Most likely, this 25% Die Break will eventually show up as collectors discover more of this die marriage.

There maybe other specimens (other than 0%, 25%, 50%, 75% and 100%) that are slightly different but I would think in general most coins would fit into these 5 Stages.

The obverse of 1838 GR-5 (shown at the beginning) also has a die break that starts to the right of the date and continues through the base of 1838 to the tip of the bust and further continues to Star 1, just left of the tip of Liberty's Bust. As Dick Graham said in his book "An extremely rare variety due to what appears to be the early and quick break-up of the reverse die."

After the Mint Employees noticed the break-up of this reverse, they replaced it with a new reverse and the combination became known as 1838 GR-6. So far, a Prime example of 1838 GR-5 (no die breaks on the obverse or reverse) has not been found.

The John Reich Collectors Society (JRCS) issued Volume 28/Issue 3 of their JR Journal, November 2018. In it was the **first** census of Reeded Edge Half Dollars. The Census listed (11) 1838 GR-5's.

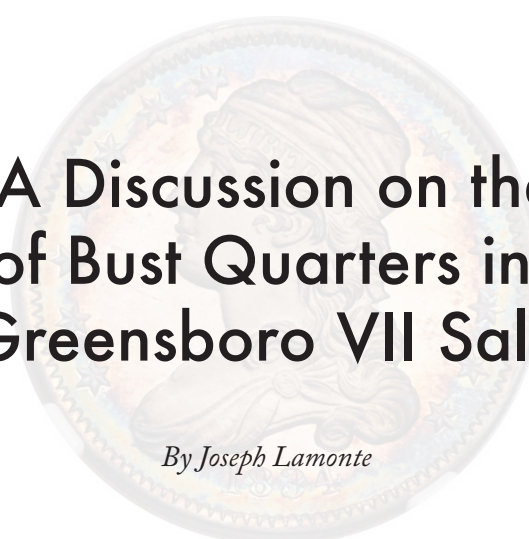
So, in conclusion, since Overton ignored Reeded Edge Halves, no one collects by Beistle Numbers, a small handful may have collected by Reiver Numbers, less than 425 have seen Graham's book and less than 100 have seen my book, that leaves less than 525 that have any clue to the rarities of Reeded Edge Half Dollars. Maybe a few more if you count auction catalogs and the Census reported in the JR Journal.

Should the reader discover another specimen of 1838 GR-5, please report it to me, Jim Koenings, by either phoning me at **(951) 242-1858** or by emailing me at **bustcoin1@verizon.net** .

BIBLIOGRAPHY

1. Beistle, M. L. A Registry of Half Dollar Die Varieties. Shippensburg, PA: The Beistle Company, 1929.
2. Overton, Al C. Early Half Dollar Die Varieties 1794-1836. Third Edition, First Printing , Ed. Donald L. Parsley. Escondido, CA, 1990.
3. Piper, Richard. The Elusive 1836 Reeded Edge Half Dollar. Wheaton, IL: Piper Publications, 1976.
4. Reiver, Jules. Variety Identification Manual for United States Reeded Edge Half Dollars 1836-1839. Willington, DE, 1988.
5. Graham, Dick. A Registry of Die Varieties of Reeded Edge Half Dollars 1836-1839. Frederick, MA, 2012.
6. Koenings, Jim. Reeded Edge Half Dollars 1836 to 1839, R-4 to R-8 Die Varieties. Riverside, CA, 2018.

Jim will be the featured speaker at the Bust Half Nut Club general meeting on Thursday August, 15 from 2-4 in room 22 of the Stephens Convention Center.. He will be talking about the 1837 Reeded Edge half dollar die marriages GR-23 and 25 and requests any collectors attending to please bring their examples of these two die marriages for study.



A Discussion on the Proof Bust Quarters in the Greensboro VII Sale

By Joseph Lamonte

A rare opportunity occurred at the FUN Show in Orlando this January. The Heritage Auction of the Greensboro Collection Part VII offered Proof Bust coin collectors the chance to view, and possibly bid on, 14 different Proof Capped Bust Quarters. A nearly complete old time collection of large size Capped Bust Quarters was also available for variety collectors to make acquisitions or upgrades.

This article will focus on the Proof Capped Bust Quarters in the sale beginning with the R-8 1818 NGC Proof 67 CAC coin (The only one available to collectors) and ending with a High R-7 1838 NGC Proof 68* Cameo Quarter (4 known). This sale will certainly be mentioned along with the likes of Garrett, Norweb, Eliasberg, Pittman and Pogue when Proof Capped Bust Quarters are the topic. Prices realized ranged from \$24,000 for an ANACS Proof 64 1831 B-4 Quarter to a high of \$444,000 for a PCGS Proof 65 B-1 1827 original quarter, which had not been seen at public auction since Auction '89 was held by Superior in July 1989.

Comparing this sale to other great collections that have been sold since the 1980's and 1990's is easy. The Norweb Collection Sale Part II held on March 24 and 25, 1988 by Bowers and Merena contained 10 (possibly 11) Proof Capped Bust Quarters. Two of the coins were called one sided proofs and one was called proof-like or proof. One 1820 B-4 that was called a one-sided proof is now certified in a PCGS Proof 64 holder. Two of the Norweb quarters were later offered in the Pogue Sale held by Stack's Bowers Galleries on May 19, 2015. The 1831 B-5 PCGS Proof 65 Cameo Quarter sold for \$105,750 in the Pogue Sale. The Norweb 1834 B-2 PCGS Proof 67 Cameo realized \$329,000.

The Eliasberg Collection Sale held on April 6-8, 1997 contained 10 different Proof Capped Bust Quarters. Two of the Eliasberg quarters were also in the Pogue Sale mentioned earlier. The 1821 B-5 Quarter was graded PCGS Proof 67 and realized \$235,000. The 1822 B-1 PCGS Proof 67 Quarter realized \$246,750.

The John Jay Pittman Collection Sale Part II auctioned by David Akers was held on May 20-21, 1998. This sale contained 8 Proof Capped Bust Quarters. Two of the Pittman quarters were also offered in the Pogue Part I Sale. An 1837 B-2 PCGS MS 67 Quarter in the Pogue Sale was sold as a Gem Proof in the Pittman Sale. The coin sold for \$152,750. Whether it is a Proof or not is uncertain. Also, the Pittman 1838 B-1 PCGS Proof 66 coin realized \$94,000.

The D. Brent Pogue Collection Part I Sale held on May 19, 2015 by Stack's Bowers Galleries-Sotheby's contained 9 Proof Capped Bust Quarters. Six coins were mentioned earlier from the Norweb, Eliasberg and Pittman Sales that were sold in the Pogue Sale. Two Proof Quarters in the Pogue Sale were from the Garrett Collection Sale Part II held on March 26-27, 1980 by Bowers and Ruddy. An 1822 B-2 25c/50c PCGS Proof 65 realized \$223,250. The finest known 1827 B-1 original quarter graded PCGS Proof 66+ realized \$705,000 setting a new record price. This coin sold for \$190,000 in the original Garrett Sale. The Garrett Sale Part II only offered 3 (possibly 4) Proof Capped Bust Quarters but all were very exceptional coins. The only quarter not mentioned in the Pogue Sale Part I was the 1820 B-1 PCGS Proof 66 coin which realized \$188,000. This coin appeared previously in a sale by Heritage in September 2005. Most of the quarters in the Pogue Sale were the finest known or tied for finest known. The 9 Proof Capped Bust Quarters in this sale realized a staggering total of \$2,279,500! This was the first major auction where all of the Proof Capped Bust Quarters were graded by a third-party grading service.

And now we will discuss the 14 Proof Capped Bust Quarters in the Greensboro Part VII Auction held by Heritage on January 10, 2019.

- **1818 NGC Proof 67 CAC B-8, R-8 as a Proof, @ \$288,000.** This coin is the only coin that is available to collectors and the finest known for the year. It also has a pedigree dating back to the Thomas Cleneay Sale by the Chapman Bros. in December 1890. It is the Browning Plate coin and had been off the market for decades when it appeared in the Eric P. Newman Educational Society Sale held by Heritage in November 2013. Prices were very strong in that sale where this quarter realized \$381,875. The only other 1818 Proof Quarter known is the B-2 coin in the Smithsonian Collection with an estimated grade of Proof 62.
- **1820 NGC Proof 64 CAC B-1 High R-7 as a Proof @ \$78,000.** There are just five coins graded for 1820 at PCGS and NGC. The PCGS Population Report lists two Proof 66 Quarters and one Proof 64 which are three different coins. The NGC Census has two coins listed: a Proof 67 and a Proof 64. The Proof 67 coin may or may not be a duplication since the Pogue PCGS B-1 Proof 66 Quarter was previously graded Proof 67 by NGC. The NGC Proof 64 is the B-1 Quarter in the Greensboro Sale. This coin last sold in a Heritage Auction in May 2008 for \$97,750. Heritage also mentions a B-2 1820 Proof 63 uncertified Quarter in the Smithsonian Collection. Even with possibly five coins certified as Proofs, 1820 Proof Quarters are unlikely to be offered at auction anytime in the near future.

- **1821 NGC Proof 65 B-4, High R-7 as a Proof @ \$78,000.** This quarter is pedigreed to The Reed Hawn Collection sold by Stack's in March 1977. It was sold most recently by Heritage at the Eugene H. Gardner Sale in October 2014 for \$94,000. There are 5 coins graded at PCGS and NGC for the year 1821. Only one Proof Quarter is graded at PCGS. It is the Eliasberg / Pogue Gem Proof 67 coin. The NGC Census lists 4 coins: One Proof 67, two Proof 65 (one is this coin) and one Proof 64 (B-4). Duplications are very possible with the NGC graded coins. The Smithsonian Collection contains an 1821 B-5 Proof Capped Bust Quarter with an approximate grade of Proof 62.
- **1822 NGC Proof 63 B-1, High R-7 as a Proof @ \$26,400.** For the third year in a row there are five Proof Capped Bust Quarters certified at PCGS and NGC for the date. PCGS has certified 4 coins: One Proof 67 B-1 Eliasberg/Pogue coin and three Proof 65 examples. One of the Proof 65 coins is a B-1 from the Pittman Sale. Another Proof 65 is a B-2 from the J.A. Stack Sale held on March 13, 1975. The third Proof 65 may or may not be a duplication of one of these coins. NGC has only graded the Greensboro coin as Proof 63. This coin was last sold by Heritage in April 2009 for \$40,250. One 1822 B-2 Proof Bust Quarter is in the Smithsonian Collection with an approximate grade of Proof 62.
- **1827/3 PCGS Proof 65 B-1, original, R-7 @ \$444,000.** The 1827 Original Quarter in this sale has a fabulous pedigree dating back to the 1867 Joseph Zandoni Collection Sale held by Edward Cogan. Many noted numismatists have owned this coin over the last century and a half. This particular coin and the Restrike following in the sale have not been sold at auction since the late 1980's. The population reports are most likely inflated due to resubmissions. Only nine different examples are known of the 1827 B-1 Original Quarters including the Smithsonian example, yet the combined population at PCGS and NGC is twelve coins. This particular coin last sold at auction in Auction '89 by Superior in July 1989 for \$79,500 and was graded by NGC as a proof 64. There is an example of the 1827/3 Original Quarter in the Smithsonian Collection with an approximate grade of Proof 63.
- **1827/3 PCGS Proof 66 CAC Restrike B-2, Hi R-6 @ \$168,000.** This coin is tied for the finest known 1827/3 Restrike Quarters and it was last offered at public auction in the Norweb Collection Sale by Bowers and Merena in March 1988. The population reports are severely inflated regarding the 1827/3 Restrike Quarters. With only nine coins known and two essay coins certified as Restrikes the total population of twenty-one coins certified is inaccurate to say the least. There are no 1827/3 Restrike Quarters in the Smithsonian Collection.

- **1828 NGC Proof 66 B-4, R-7 as a Proof@ \$52,800.** This coin is from the John Jay Pittman Collection Sale held by David Akers in May 1998. Interestingly the price realized in that sale was \$60,500 for an uncertified coin. Later in a Rarities Sale by Bowers and Merena in February 2007 this same quarter sold for \$70,725 in an NGC Proof 66 holder. It is intriguing that this coin has continued to realize less money in each succeeding auction. The total population at both grading services is 11 coins. Since there are at least 8 known certified 1828 B-4 Proof Bust Quarters and one in the Smithsonian Collection with an estimated grade of Proof 60, that number is not too far off.
- **1831 ANACS Proof 64 B-4 Small Letters @ \$24,000.** This coin was last sold in January 2006 by Heritage for \$29,900. According to the Rea-Koenings-Haroutunian Census there are 4 different B-4 1831 Proof Bust Quarters. Noted expert David Akers stated unequivocally that only the B-5 1831 Capped Bust Quarter are Proofs. That may help explain the low price realized for a Proof 64 Capped Bust Quarter.
- **1831 NGC Proof 65 Cameo B-5, R-7 as a Proof @ \$50,400.** The previous sale of this coin was in an April 2009 Heritage Sale where the price realized was \$51,750. 1831 Proof Capped Bust Quarters are the most obtainable coins in the series. At present, there are 16 coins graded at PCGS and NGC. It is possible that two or three of those coins are duplicated in the census. There is an 1831 Proof Quarter in the Smithsonian Collection with an approximate grade of Proof 60.
- **1833 PCGS Proof 65 Cameo CAC B-1 , High R-7 @ \$168,000.** This coin was last sold in May 2008 by Heritage where it realized \$149,500. There are only three different certified coins for the year 1833 that are presently accounted for even though the certified population total is eight coins. This coin is the finest known followed by the NGC Proof 65 Eliasberg coin. The Pittman coin is graded PCGS Proof 64 Cameo CAC. Maybe in the future one or two more Proof 1833 Quarters will surface. There is a Proof 1833 Quarter in the Smithsonian Collection with an approximate grade of Proof 60+.
- **1834 NGC Proof 66+ Ultra Cameo CAC B-2, R-7 as a proof @ \$198,000.** This fantastic gem proof coin was last sold by Heritage in January 2013 for \$235,000 in the Eric P. Newman Numismatic Society Auction. Since the Greensboro Part VII Sale it has crossed over to PCGS and is now graded Proof 66+ Cameo with CAC approval. The combined population report for PCGS and NGC Proof 1834 Capped Bust Quarters is 13 coins as of February 23, 2019. Eight of the thirteen coins are graded Proof 64 and half of those are most likely duplicate coins. There is a Proof B-2 Quarter in the Smithsonian Collection with an approximate grade of Proof 63.
- **1835 NGC Proof 64 B-7, R-7 as a Proof @ \$36,000.** This coin most recently sold in the May 2015 Eugene H. Gardner Sale by Heritage for \$76,375. The combined population between PCGS and NGC is 9 coins for the year 1835. As stated in the Heritage Catalog: "We have been able to confirm the survival of just eight 1835

Proof Quarters, including a single B-1 representative, pedigreed to the Eliasberg Collection and seven B-7 examples". One of the seven B-7 Proof Quarters is in the Smithsonian Collection with an approximate grade of Proof 60+.

- **1836 NGC Proof 67 B-2, High R-7 as a Proof @ \$132,000.** This Gem Proof Quarter last sold in January 2006 for \$97,750 in the FUN Signature Sale by Heritage. Only 3 coins for this year and type are certified at both grading services. This coin is the finest known example of an 1836 Proof Bust Quarter and is now in PCGS Proof 66 holder with CAC approval. One other 1836 coin is graded at PCGS Proof 64 Cameo CAC. The third certified coin is graded by NGC as Proof 64. There is also a fourth B-2 quarter that resides at the Smithsonian Collection graded approximately Proof 60+.
- **1838 NGC Proof 68* Cameo B-1, High R-7 as a Proof @ \$144,000.** This gem proof quarter from the Norweb Collection is one of only 4 coins known in Proof format for 1838. The Pittman coin is graded PCGS Proof 66 and the third example is graded NGC Proof 64. The fourth coin is in the Smithsonian Collection with an approximate grade of Proof 60+.

When looking back on the Greensboro VII Sale it becomes apparent that nearly all of the Proof Bust Quarters sold for less money than in their previous auction appearances. There are several possible factors that could cause this occurrence.

The biggest question with any Proof Bust Silver, Copper or Gold coins is: IS IT A PROOF? This is a serious issue with many pre-1831 Proof Bust Quarters. There is also heated debate about only B-5 quarters being the only proof variety issued for the year 1831. At the present time PCGS has not certified any silver coins struck before 1820 as a proof. Of course, the 1801, 1802, 1803 and 1804 dollars are called proof coins but they were struck in 1834 and later. The 1818 Quarter in this sale is a gorgeous coin. But, is it a proof? NGC and CAC say yes but PCGS does not agree.

A second factor affecting price is: Is the coin over graded? Certain coins in this sale may be over graded by a point or two when using today's grading standards. Some coins from famous old collections may have gotten a slightly better grade than they would receive in today's climate.

A third important factor is toning. Attractive toning is playing a much larger role in prices realized in auctions today. Early Proof Bust coins rarely have the bullseye or rainbow toning found on many Seated coins or Morgan Dollars. Attractive peripheral toned coins as seen on the 1818, 1834 and 1836 quarters in this sale are rarely encountered and bring strong prices. Some of the Quarters in this sale had darker or mottled toning which is not in vogue at the present time.

A fourth factor which is becoming more important in today's market is the CAC (Certified Acceptance Corporation) green bean. Whether a collector is a big fan of CAC or not, like rock and roll CAC is here to stay. Studying auction prices realized for

many different types of U.S. coins proves that CAC coins are bringing higher prices. The premiums may be ten per cent higher to nearly double what a similarly graded coin from the same service will receive. In this sale only five of the fourteen coins met the criteria to get a CAC green bean.

The Greensboro VII Sale was a very interesting convergence for Proof Bust collectors. The author feels like that the weaker prices realized are indicative of modern collectors having access to huge amounts of information that only a few experts may have had in the past. With all of the information available today's collectors are much more demanding and savvy than in the good old days of yesteryear.

Comments and questions to slamo@att.net

CREDITS:

Bowers and Merena, Inc.: The Norweb Collection Sale Part II held in March 1988 and the Louis E. Eliasberg, Sr. Collection Sale held in April 1997.

Bowers and Ruddy Galleries: The Garrett Collection Sale Part II held in March 1980.

"Early Quarter Dollars of the United States Mint" by Rory R. Rea, Dr. Glenn Peterson, Bradley S. Karoleff and John J. Kovach, Jr.

Heritage: U.S. Coin Auction FUN Show Platinum Night, January 2019 and the Auction Archives.

Jeff Garrett: "When Proofs Were New" in Coinweek, November 5, 2018.

Karl Moulton for his research on 1827 Quarters, both originals and restrikes.

PCGS: Coinfacts and Auction Prices Realized.

Stack's/Bowers: The D. Brent Pogue Collection Part I held in May 2015.

Steve Tompkins: "Early United States Quarters", 1796-1838.



*1818 NGC Proof 67 CAC Bust Quarter
Ex: Cleneay and Newman collections
Browning Plate Coin
Photo courtesy of Heritage Auctions*



*1834 NGC Proof 66+ Ultra Cameo CAC Bust Quarter
Now PCGS Proof 66+ Cameo CAC
Ex: Newman Collection
Photo courtesy of Heritage Auctions*

The W. Earl Spies Heavily Annotated Copy of Milferd H. Bolender's THE UNITED STATES EARLY DOLLARS FROM 1794 TO 1803

By W. David Perkins, NLG

THE UNITED STATES EARLY DOLLARS FROM 1794 TO 1803 by Milferd H. Bolender was first published in 1950, effectively replacing the Haseltine Type Table of 1881 as the standard reference for the collecting of the early dollars 1794-1803 by die marriage.

Over the past 30 plus years I've researched and written about the great collector's and collections of early silver dollars. One of these collectors was W. Earl Spies. I was successful tracking down Mr. Spies' son (who was in his 80s!) a decade or so ago after searching for quite some time. Earl Spies had a stroke in 1971, and his collection of early dollars 1794-1803 by die marriage and die state was sold at public auction by Stack's December 9, 10, 1974. The early dollars spanned Lots 1-236, slightly over twice the number of die marriages existing at this time. This probably was, and still is, the largest number of early dollar die states of any collection of early dollars ever offered.

As a side note, it turns out that W. Earl Spies had one of the most extensive collections of Silver Dollars 1794 to 1935 (yes, 1935!) ever formed. He formed his collection mostly in the 1950s and 1960s, with the stroke in

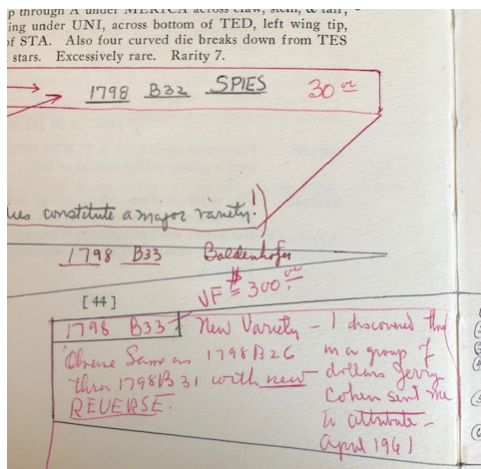


Photo 1 / Caption 1 (Notes in book for 1798 B-33)
Notes in the heavily annotated Spies copy of the Bolender book describing his discovery of the 1798 B-33 (BB-117) Dollar in 1961. This die marriage is R-8 today with three examples known.

1791 ending his collecting days. As noted above, Spies collected the early dollars 1794 to 1803 by die marriage and die state. He also collected both business strike and Proof Seated Dollars 1840 to 1873. He also assembled a complete collection of Morgan and Peace Dollars.

In December 2017 I acquired Earl Spies' heavily annotated copy of the first edition of the Bolender book, a gift from his son William (Bill) Spies. The main purpose of this short article is to report this acquisition and share a few highlights with the JRCS membership.

Inside the cover there are notes on, of all things, Liberty Seated Dollars 1840-1857. An ad for the 1974 sale of his early dollars from the *New York Times* dated November 24, 1974 is tipped in. Photos and descriptions for three newly discovered Flowing Hair Dollar die marriages ("Not in the Bolender Book") were next, including the 1796 B-6, BB-64 Dollar (R-8) from the collection of Jules Reiver. Two of the 1795 FH Dollar photos were of coins in the Frank M. Stirling Collection and one from Eliasberg (B-19, BB-19), later owned by Warren Miller, a long-time collector and JRCS member who completed a collection of all 118 die marriages of early dollars (known at the time that he collected). There were notes written in the book for most of the die marriages, including specimens in his collection with the purchase price and the source. Inside the back covers is a list of names, addresses, and phone numbers which appear to be the collectors and dealers from whom he bought and sold. Lastly a two-page letter to Frank Stirling dated Friday, December 21, 1955 discussing a number of topics of mutual interest.

As many of you know, I collect the "Dollars of 1798" by die marriage. It was reported in the April 25, 1973 *Coin World* newspaper that Jules Reiver and dealer Mulford B. Simons of Penn Valley Rare Coins had discovered a new die marriage, 1798 B-33 (BB-117). I later determined Spies had discovered the marriage prior to 1973 but had never reported the discovery. I also never knew when it was discovered, only that it was after Bolender's book was published in 1950. Many years later this book gives us more detail on Spies' discovery of the B-33, BB-117 die marriage, an R-8 with only three examples known today. Spies owned two of these, and Reiver the other. From the annotated book,

"1798 B33. New Variety – Obverse Same as 1798 B26 thru B32 with new REVERSE. I discovered this in a group of dollars Jerry Cohen sent me to attribute – April 1961."

This was a fun acquisition for me both from a research standpoint and as I've had the privilege of owning all three examples of this die marriage at one time. Unfortunately, I still can't figure out which of the two Spies B-33 die marriages is the "Discovery Specimen."

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|--|--|
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| d _____ Draped Bust Small Eagle Dimes | k _____ Capped Bust Half Dollars |
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